sary factor, explanation for the apparent high immunity to kala-azar among infants might be found in as simple a fact as their inability to slap when bitten.

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Antipneumococcus Protective Substances in Normal Pig Serum.

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It has been generally held that natural immunity to the Pneumococcus, in common with other pathogenic micro-organisms, depends on a fundamental cellular difference of the host rather than on circulating antibodies.[1, 2] Bull and McKee,[3] however, showed that normal chicken serum was capable of protecting mice and guinea pigs against many times the fatal dose of virulent pneumococci. Furthermore, in a recent publication,[4] evidence was presented to indicate that a high concentration of antipneumococcus opsonins in the blood of naturally resistant mammals forms a common means of defense against pneumococcus infection. These findings would suggest that humoral defensive elements may play a much more important rôle in the mechanism of natural immunity than has hitherto been believed. This report presents further evidence in support of this view.

In the present study, serum from pigs, a naturally pneumococcus-resistant species, has been employed. Table I represents the protocol of an experiment in which white mice weighing about 20 gm. were each given intraperitoneal injections of 1 cc. of pig serum and 4 hours later varying amounts of an actively growing culture of a virulent Type I pneumococcus. Sera from susceptible animals, the rabbit and the guinea pig, were used as controls. It is clearly shown that normal pig serum protected mice against 10,000 times the minimum fatal dose while rabbit or guinea pig serum conferred no protection on mice against pneumococcus infection. Mice receiving less than 0.01 cc. of culture were protected by the pig serum, whereas 0.000,000,1 cc. of the same culture alone killed mice regularly.

[1] Zinsser, H., "Infection and Resistance," New York, 3rd edition, 1923, 68.

[2] Eastwood, A., *Rep. Pub. Health and Med. Subj.*, Ministry of Health, No. 22, 1923, 15.

[3] Bull, C. G., and McKee, C. M., *Am. J. Hyg.*, 1921, i, 284.

[4] Robertson, O. H., and Sia, R. H. P., *J. Exp. Med.*, 1927, xlvi, 239.

TABLE I.
Protective Action of Pig Serum Compared with Rabbit and Guinea Pig Sera for White Mice.

Kind of Serum	Amount of serum	Amount of pneumococcus culture	Result
	cc.	cc	
Pig serum	1.0	0.01	D
	1.0	0.001	S
	1.0	0.0001*	S
Controls with sera of susceptible animals			
Rabbit serum	1.0	0.0000001	D
Guinea pig serum	1.0	0.0000001	D
Controls without serum	—	0.000001	D
	—	0.0000001	D

D, died in 12 to 48 hrs. S, survived 7 days.
* Mice receiving pig serum and 0.00001, 0.000001 and 0.0000001 cc. pneumococcus cultures also survived.

Similarly, pig serum has been found to protect mice against virulent Type II and to a lesser degree Type III pneumococci.

In two previous studies,[5, 6] results were recorded to suggest the specificity of natural pneumococcus-opsonins. Attempts, therefore, have also been made to determine if the antipneumococcus protective substances in normal pig serum were type specific. For this purpose, pig serum was first absorbed by a Type I pneumococcus, and the absorbed serum after centrifugation and Berkefeld filtration was employed in mouse protection tests against a Type I and Type II pneumococci. Results of such an experiment are given in Table

TABLE II.
Pig Serum Absorbed by Pneumococcus Type I.

Pig Serum	Amount of serum	Amount of Type I pneumococcus cult.	Amt. of Type II pneumococcus cult.	Result
	cc.	cc.	cc.	
Absorbed	1.0	0.000001		D
	1.0	0.0000001		D
	1.0		0.1	D
	1.0		0.01	S
	1.0		0.001	S
Unabsorbed	1.0	0.01		D
	1.0	0.001		S
	1.0	0.0001		S
	1.0		0.1	D
	1.0		0.01	S
	1.0		0.001	S
Controls without serum	—	0.0000001		D
	—		0.0000001	D

[5] Sia, R. H. P., *J. Exp. Med.*, 1926, xliii, 633.
[6] Sia, R. H. P., PROC. SOC. EXP. BIOL. AND MED., 1927, xxiv, 709.

II. It is seen that while the absorbed serum lost all of the protective substances against Type I pneumococcus, the protective properties for the Type II pneumococcus remained unaltered.

Specific absorption with a Pneumococcus Type II has given equally convincing results.

Summary. By means of mouse protection tests, it has been possible to demonstrate the existence of antipneumococcus protective substances in normal pig serum. Furthermore, these protective substances have been found to be type specific.